



MSFC PROPULSION SYSTEMS DEPARTMENT

Knowledge Management Project

NASA KM International Conference

17 - 19 July 2007



Collaborate...



Communicate...



Innovate...

Motivate



Agenda

MSFC PROPULSION SYSTEMS DEPARTMENT

Knowledge Management Pilot Project

- PSD KM Project Overview / Approach / Purpose
- Strategic Planning of PSD KM Initiative
- Systems Requirements / Design Definition
- KM Technology Architecture Description
- PSD KM System UI / Custom Features
- Future Planning
- PSD KM Search Functionality Demo



MSFC PSD KM STRATEGIC PLAN

Overview/Approach

- **KM Needed to Support Knowledge Capture/Preservation and an Information Sharing Culture**
 - “If MSFC is to remain world-class in rocket propulsion systems design and development, substantial improvement in access to current and historical design, development and operational information must be made.” *
 - “NASA has not demonstrated the characteristics of a learning organization after investigators observed mistakes being repeated...” **
- **MSFC PSD KM initiative approach**
 - Develop a KM Pilot project, within the context of a 3-5 year KM strategy
 - Introduce and evaluate the use of KM within PSD
 - IT Infrastructure, Turbomachinery Community of Practice (CoP)
 - Extend KM system functionality using results-based methodology



MSFC PSD KM Initiative

Project Purpose

- **Develop a Knowledge Management Strategic Plan for MSFC PSD**
- **Define and Prioritize KM requirements, tailored to PSD's goals and objectives**
- **Provide KM IT infrastructure, processes and tools to enable and promote a learning / sharing culture**
- **Assure enterprise alignment and extensibility of PSD KM solution**
- **Apply leading edge Knowledge Management technologies and organizational practices to institutionalize NASA's experiences—promoting NASA engineer's competencies and growth.**



MSFC PSD KM Initiative

KM Project Key Priorities

- Improve Safety, Reliability and Quality
- Reduce risk and impact of knowledge attrition associated with an aging workforce.
- Enable Learning Sharing Culture
 - Communities of Practice, collaboration, knowledge sharing/capture
 - Training
- Provide Efficient, Effective Access To Propulsion Systems And Component Knowledge Data
 - Apply cutting edge technologies and innovation to PSD knowledge assets
 - Infuse experiential knowledge, lessons learned, best practices into decision process
 - Reduce Test/Fail/Fix cycle resulting from failures and anomalies
- Demonstrate KM utility and functionality
- Increase stakeholders' awareness of KM technical innovations and benefits
- Extend PSD KM system functionality
 - ARES propulsion systems and component designs
 - Engineering Directorate
 - MSFC...



MSFC PSD KM STRATEGIC PLANNING

Data Gathering

- **Formed PSD KM Team**
- **Conducted Two Day Group Work-Session for PSD KM Strategy Formulation**
 - Developed PSD KM Purpose, Objectives, Priorities
- **Conducted Structured Interviews**
 - Examined Engineering Process Workflows
 - Collaborative, Resource and Analytical Tool Interfaces
- **Surveyed Personnel**
- **Performed Independent Research**



MSFC PSD KM STRATEGIC PLANNING

Cultural Change

Cultural Change Survey

➤ PSD Benchmarking

- Working Together
 - Knowledge Sharing Incentives
 - Enterprise KM Strategy
 - Existing KM Infrastructure, capabilities
 - Senior Management Advocacy
 - Skills & Competencies
 - Change Management
 - Workforce Development
 - Organizational Alignment
 - Operational Processes
 - Performance Measurement
 - Evaluation & Feedback
 - Accountability & Empowerment

Number:	Date:	(Optional) Name:				
1	Poor, or "Strongly Disagree"	1 Poor, or "Strongly Disagree" - Fundamental organizational changes are needed.				
2	Fair, or "Disagree"	2 Fair, or "Disagree" - Major improvements are needed.				
3	Adequate, or "Neutral"	3 Adequate, or "Neutral" - Moderate changes would help the organization				
4	Good, or "Agree"	4 Good, or "Agree" - Some opportunities for improvement/reform exist.				
5	Excellent, or "Strongly Agree"	5 Excellent, or "Strongly Agree" - Little room for improvement in this area.				
Information						
1	I can explain the organization's business goals, objectives, and strategies.	Poor Fair				
2	I understand the organization's general financial picture.	Adequate Good				
3	I have an effective way to communicate with top management.	Excellent				
Organizational Alignment						
4	Everyone (individuals, teams, departments/units) is working toward the same organizational goals and objectives.	5 4 3 2 1				
5	I understand how my job relates to my department/unit and the rest of the organization.	5 4 3 2 1				
6	I understand how my job contributes to the organization's objectives, goals and strategies.	5 4 3 2 1				
7	All employees understand their jobs and how those jobs relate to their departments/units and the rest of the organization.	5 4 3 2 1				
Operational Processes						
9	I understand the organization's operational processes and how they support the organization's objectives, goals, and strategies.	5 4 3 2 1				
10	I can identify and describe the operational processes in which I participate.	5 4 3 2 1				
11	The processes in which I participate are clearly documented and that documentation is readily available whenever I need it.	5 4 3 2 1				
12	I understand the processes in which I participate relate to the organization's objectives, goals, and strategies.	5 4 3 2 1				
13	I understand how my tasks add value.	5 4 3 2 1				
14	I understand how my tasks are performed by others.	5 4 3 2 1				
15	There is little redundancy or waste in our business processes.	5 4 3 2 1				

PSD is perceived by survey respondents as being ready to accept cultural change.

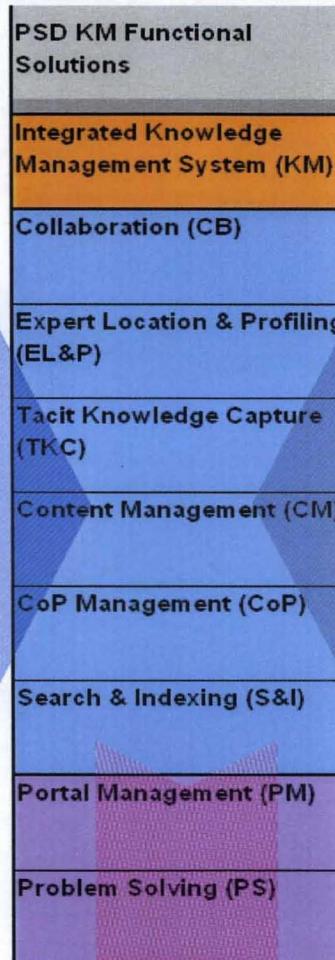
Challenges identified:
KM Infrastructure/Tools,
Knowledge Sharing Motivation & Incentives,
Leadership Advocacy



MSFC PSD KM STRATEGIC PLANNING Solutions Map

PSD KM Strategic Objectives

1. Access-Links to External Databases, and Repositories
2. Intelligent Search Capabilities
3. Enterprise System Architecture and Design
4. Access-Links to Internal Databases, and Repositories
5. Collaborative Engineering Community of Practice
6. Leverage Data-Server Ownerships
7. User-Derived Interface – Presentation Layer
8. PSD KM Process Definition



Top 10 Day-to-Day Needs

1. Access to All External Servers, Databases, and Repositories (SSME Tech, NEXPRISE, etc.)
2. Single Sign-On (SSO) for All Resources
3. Ability to Search Adobe, Image Files, Hardcopy Old Reports
4. Capture of Tacit Knowledge from All Personnel During All Project Lifecycles
5. A Collaborative Engineering Community of Practice Organized by Discipline
6. Intelligent Search and Index Tool (Multi-Tiered Search, Advanced/Boolean)
7. A Customizable User Interface Tool for Desktop for Each User
8. Utilization of the NASA Taxonomy to Structure Project Documentation
9. Access to All Internal Servers, Databases, and Repositories (Stennis RAMS, etc.)
10. Pedigree Assurance for All Project Documentation

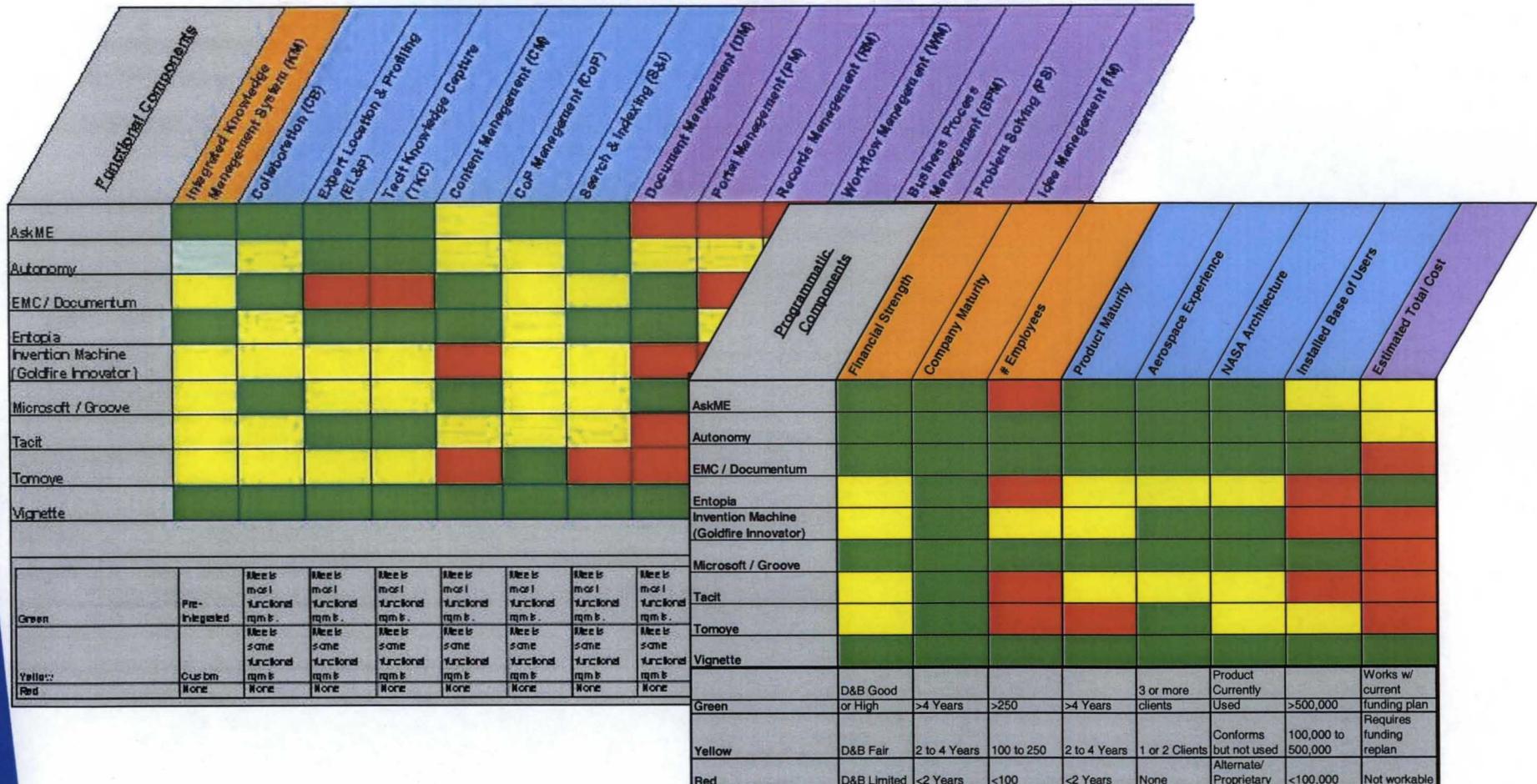
KM Solution Aligns With Team Defined Objectives and Needs



System Requirements and Design Definition

Vendor Ranking

Functional Rating

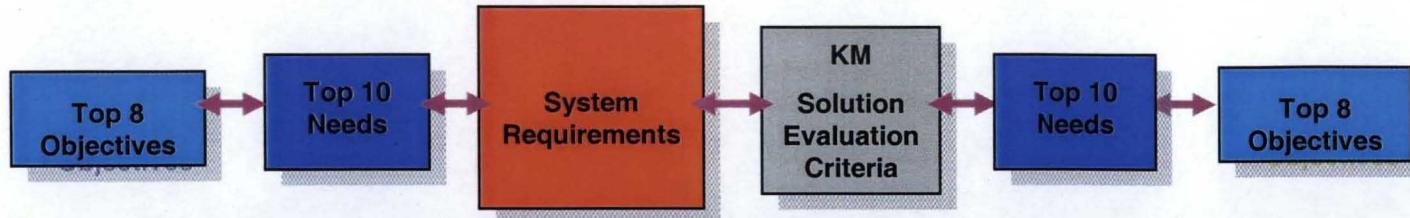


Programmatic Rating



System Requirements and Design Summary

- Rigorous systems engineering approach employed at project outset; User defined, user centric, concept to solution
 - Formed initial MSFC team using Integrated Product Team constituency
 - Included Shuttle Project & Engineering, ER Component Design, ED Disciplines, S&MA participants
 - CIO, Enterprise Architect, CLV Projects, CLV KM, NASA Engineering Network (NEN) represented in requirements / design reviews
- PSD KM Project Milestones Achieved
 - Strategy developed, Strategic Plan delivered February 2006
 - System Requirements defined, System Requirements Specification delivered May 2006
 - Conceptual Design Review conducted June 2006
 - Critical Design Review conducted October 2006
- System designed to align with CLV, Constellation and Enterprise Architecture
- Compliant with NIST / FIPS standards, application security plan is approved
- Delta Design Review will address final system design implementation
 - Open Source Portal Platform



Solution traceable to user defined objectives, user needs and system requirements



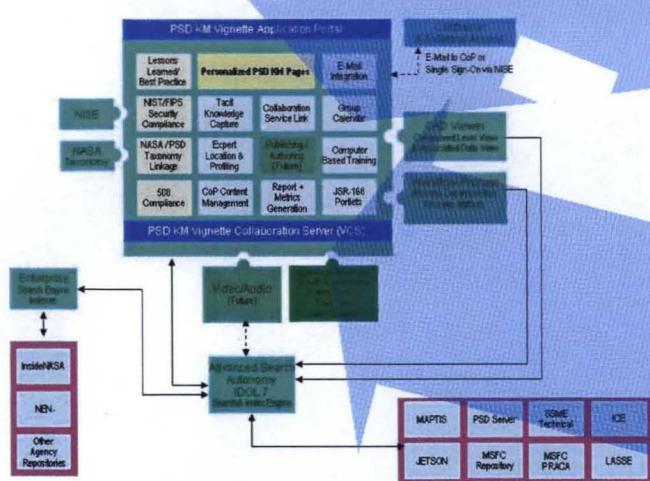
Solution Mapping / Verification

Implementing over 250 KM System Requirements Has Led to Product Development Effort and Phased Deployment

relationship and relevance to each other. [Ref SS#3], [Ref SS#5], [Ref SS#11]	X	X	the visibility and use of their profiles by others in the system.					X	X		
4.2.13.7 Collection Filtering – The system shall provide the capability to filter collections of information by attributes such as object type, file type, date, status, etc. [Ref SS#3]	X	X	If interest, connect them with users of similar		X	X					Product outputs)
4.2.13.8 Auto-Categorization – The system shall provide capability to associate documents and other artifacts with like categories. [Ref SS#3]	X	X	Items or terms of interest. [Ref SS#12]								In the parent graphical
4.2.13.9 Relevancy Ranking of Search Results – Relevance of all search results shall be presented to the user in a clear manner. [Ref SS#7]	?	?	Every so that notifications of specified items of								
4.2.13.10 'Also try searching for' Prompt – The capability to suggest alternate search criteria shall be provided to the user. [Ref SS#7]	-	-	It's to enable immediate expert identification, path. Connections to SMEs shall be through an		X	X					
4.2.13.11 'Did you mean?' Search Prompt – The search engine shall provide capability to present clarifying questions to the user when the search meaning may be ambiguous. [Ref SS#7]	-	-	X								



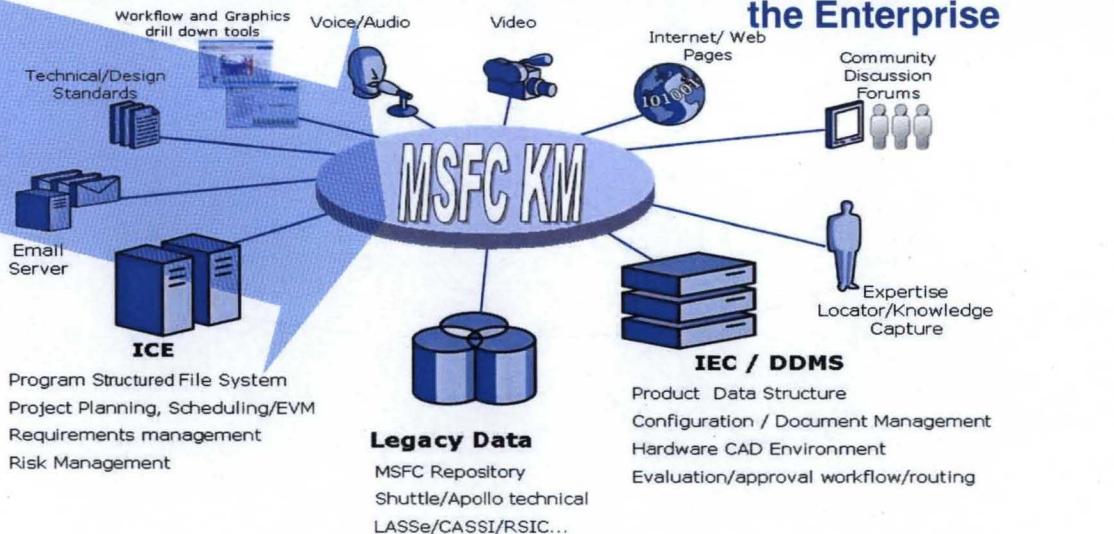
What is PSD KM?



**Network Infrastructure
SOA Integrated Tool Suite**



**Engineering Data, Collaboration
and Experiential Knowledge
Available with a Point and Click**

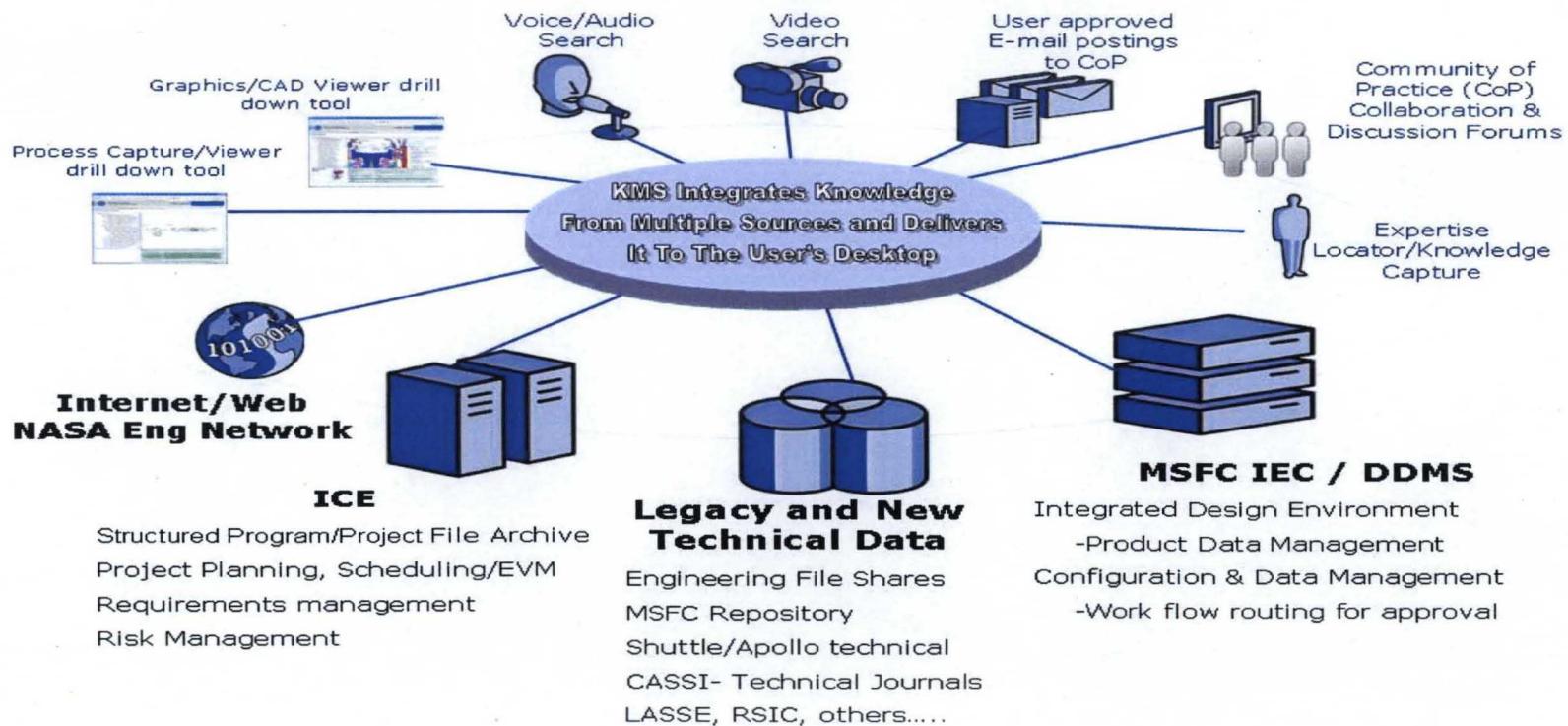




MSFC KM Key Functionality

Key KMS Features:

- Single sign-on access and advanced data search of unstructured & structured technical data archives (Super "Google")
 - Global Search Returns from all Knowledge Sources
- Human expertise locator (Ask The Expert?)
- IPT and/or discipline focused on-line "Community of Practice" Collaboration Environment
- Knowledge capture/retrieval of discussion board/e-mail threads via on-line "Community of Practice"
- Process capture/viewer with point and click navigation to each process step instructions and all relevant data
- 3D Graphics/CAD Viewer with point and click navigation to all relevant "piece-part" data



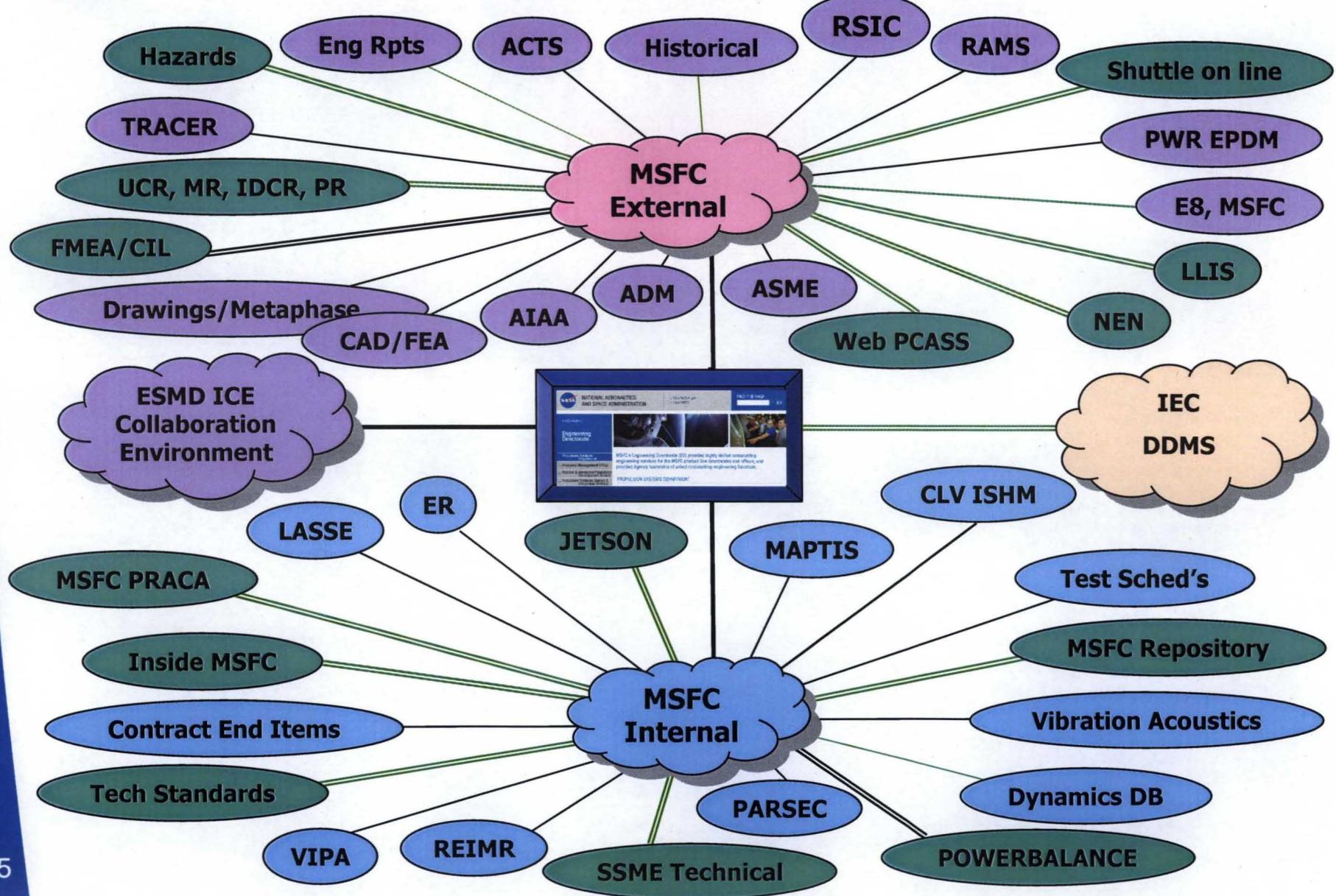


PSD KM Data Architecture Solution

- PSD KM Aligns with key CLV, Constellation and Enterprise data architecture needs
 - **Data integration and user requirements definition**
 - Engineering Community (IPT) defined requirements
 - Engineering process models (value streams)
 - Enabling data architecture, tools, collaborative, training and knowledge resources identified, mapped, integrated
 - **IT Solution User Interface Definition**
 - Develops / extends IT solution to establish a web base engineering community interface
 - Provides immediate access to mission enabling resources
 - **Leverages pilot system infrastructure and SOA KM technology investment to offer critical data architecture solutions**



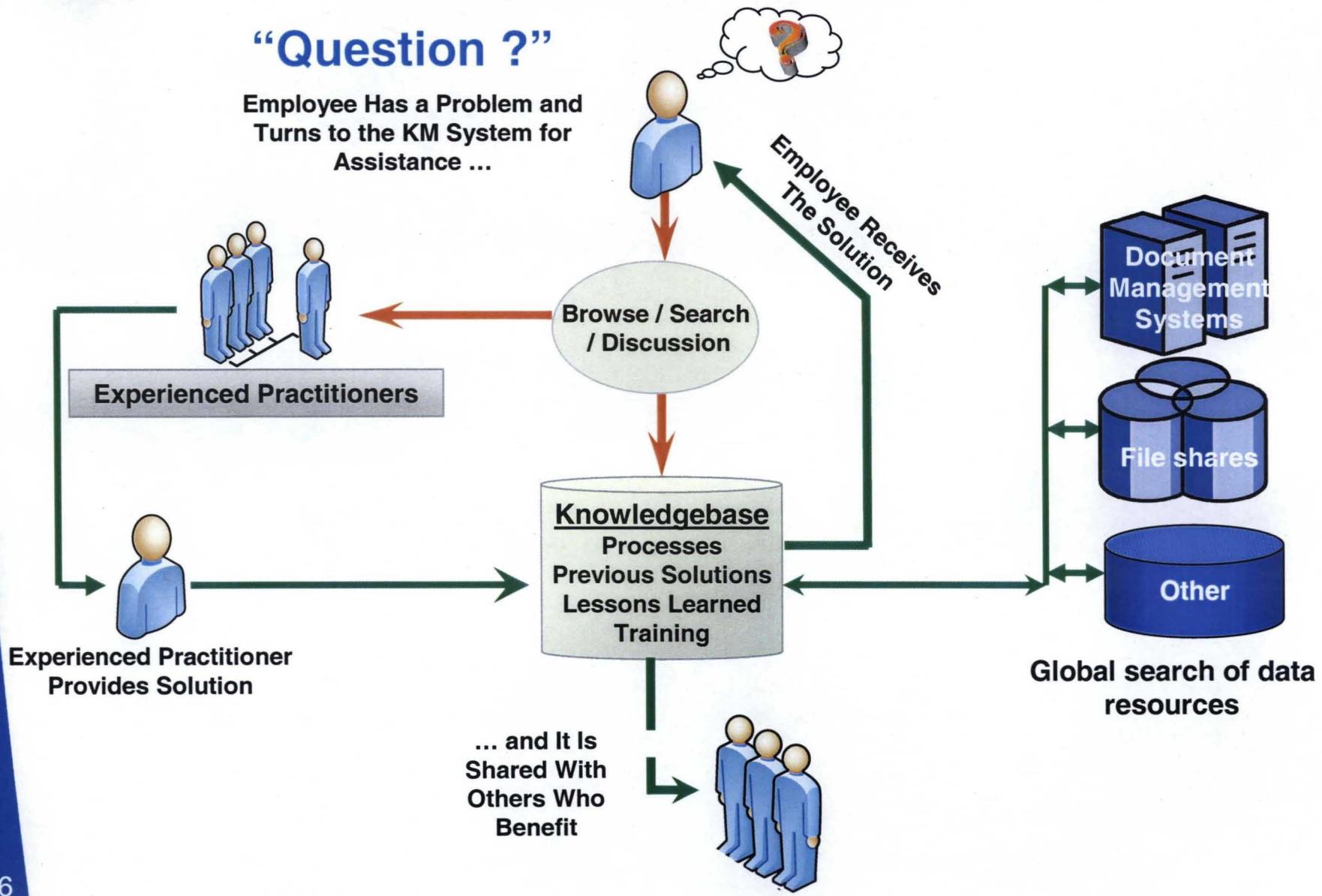
MSFC PSD KM DATA TYPES / RESOURCES





MSFC PSD KM PROJECT

Knowledge Capture





MSFC PSD KM PROJECT

Expertise Locator/Profile Builder

NASA Competency Management System

DESC0009: Design and Development Engineering (B)
Knowledge, capabilities and practices associated with all aspects of the technical design and development process including the development of flight hardware, payloads, Ground Support Equipment (GSE) technology projects, fabrication processes and techniques, concurrent engineering, production assessment, and process verification as applied to aerospace vehicles and systems used in atmospheric and space environments. Includes ability to create new based on research oriented plans and schematics and capability to design and manufactureability - No, already addressed under prior change with level 1 or right now, ground rule.

Competency Evidence: (View last modification was done on Jul 31, 2006)

Employee Expertise Level
Employee Self-Rating: 07/13/2006 Last Validated Rating: 07/31/2006 Manager Validated by: D The last tier validation was initiated 2 months ago on 07/31/2006.

Competency History
Date / Time Action performed by Change made to competency
Jul 31, 2006 1:12PM Barry Wilson The employee VALIDATED tier level was changed from=2 to=3

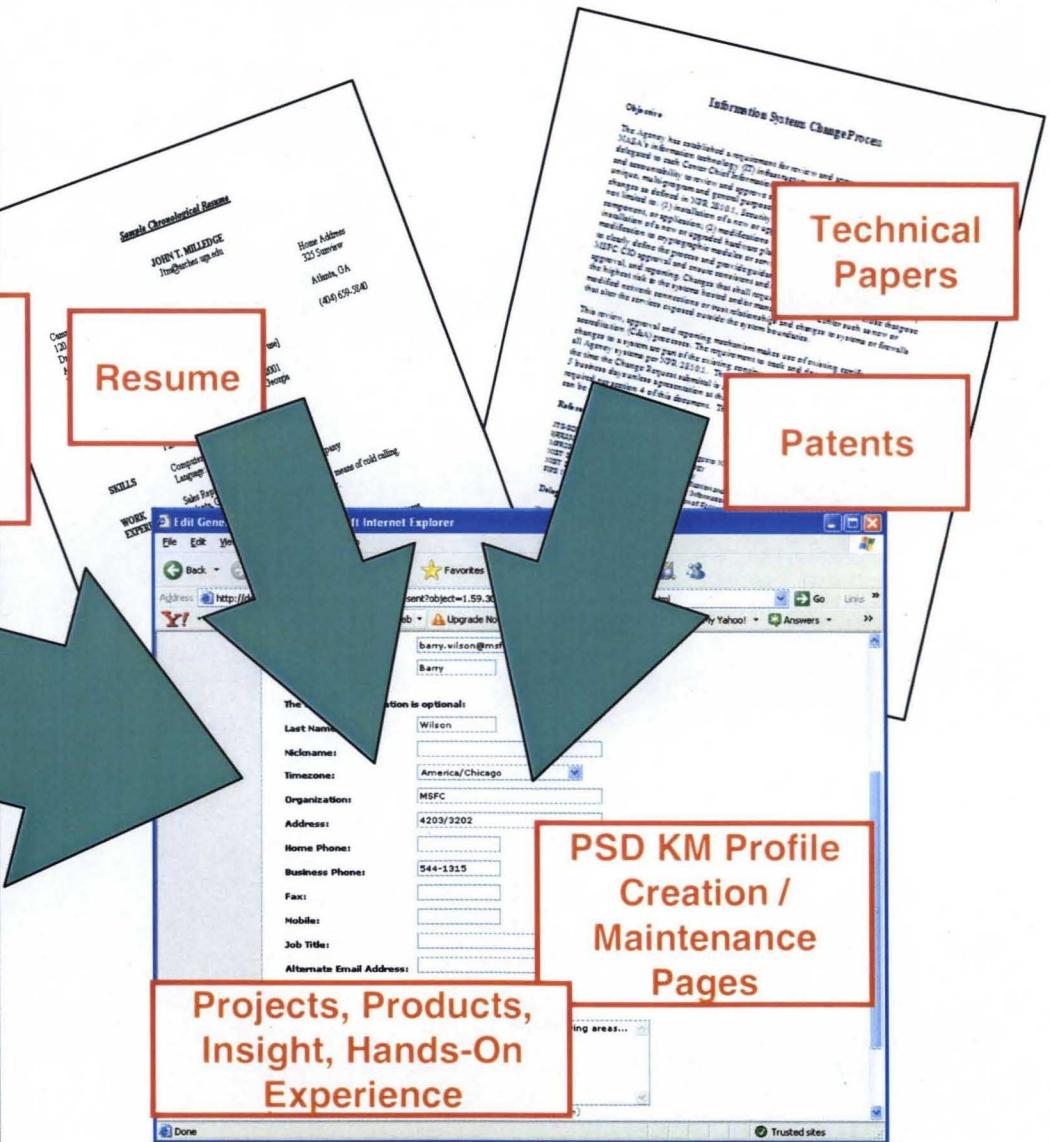
NASA Competency Management System

AST, LIQUID PROPULSION SYSTEMS

Remove Post Competence Close Details Self-rated Tier Level Validated Tier Level Validation method Need Val? Find Others

<input type="checkbox"/> (0009) Design and Development Engineering	<input type="checkbox"/> (0010) Integration Engineering	<input type="checkbox"/> (0011) Test Engineering	<input type="checkbox"/> (0027) Safety Engineering and Assurance	<input type="checkbox"/> (0028) Reliability & Maintainability Eng	<input type="checkbox"/> (0029) Rocket Propulsion	<input type="checkbox"/> (0122) Program/Project Management	<input type="checkbox"/> (1002) Knowledge & Communication Manage	<input type="checkbox"/> (1054) Combustion Devices Design and Ana
Manager Validated 07/31/2006	Manager Validated 07/31/2006	Manager Validated 07/31/2006	Manager Validated 07/31/2006	Manager Validated 07/31/2006	Manager Validated 07/31/2006	Manager Validated 07/31/2006	Manager Validated 07/31/2006	Emp Self Validated 07/18/2006
Change Tier								

Add Competencies Enter the Competency ID Number to add to your portfolio Add Competency





User Interface





MSFC PSD KM PROJECT

User Interface Navigation Flow

Category Search Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Home Stop Refresh Bookmarks 3581 blocked Check AutoComplete Send to nasa msfc

Address C:\PSD KM\Sample UI\Category Search.htm Go Links Settings

Google nasa msfc

+ NASA Home + MSFC Home

Marshall Space Flight Center

+ Propulsion Systems Department Knowledge Management System

Turbine blade ECP

Basic Advanced Boolean Parametric + GO

Categories Data Sources Query Parameters

- + Home
- + Lessons Learned
- + Best Practices
- + Configuration
 - Critical Design Review
 - Drawings
 - Engineering Change Proposals (ECP)**
 - Field Engineering Change (FEC)
 - Hardware Readiness Review (HRR)
 - High Pressure Oxidizer Turbopump (HPOTP) Photographs
 - Material
- + Critical Items List (CIL) / Hazards
- + Failure Mode & Effects Analysis (FMEA)
- + Design Environment
- + History
- + Non-Conformance
- + Service Life
- + Verification & Validation

+ COMMUNITIES + PROCESS + CAD VIEWER + MY PAGE + CLUSTERING + SAVE

- RETRIEVAL + COMMUNITY + CATEGORIES

Retrieval Results

1 - 6 of 501 results

Matching documents

85% ENGINEERING CHANGE PROPOSAL Approved With Changes/Rocketdyne concur applied Sheet... ENGINEERING CHANGE PROPOSAL Approved With Changes/Rocketdyne concur applied Sheet 1 of 789 1. Contractor) CAGE 02602 2. Contract: J. PCIN: 4. ECP No.: 5. Rev: Pratt & Whitney Rocketdyne, Inc. NASA-01140 170254 [Source: CategoryTraining] [Size: 4236 KB] iposdm\category\training\ECP_PDF\st11ecp1389x2.pdf [Similar documents]

84% ENGINEERING CHANGE PROPOSAL Sheet 1 of 466 1 Pages Affected Remarks NASA Disposition/ Authorization Basic This ECP is to update the SSME Hazard reports references to the new integrated hazard reports. [Source: CategoryTraining] [Size: 3580 KB] iposdm\category\training\ECP_PDF\st11ecp1505.pdf [Similar documents]

83% ENGINEERING CHANGE PROPOSAL Approved With Change... Justification For Change: (Including consequences if not incorporated) (Continued). The purpose of this ECP is to incorporate the HPOTP redesigned Knit Edge Seal (KES) configurations into the flight program. [Source: CategoryTraining] [Size: 1411 KB] iposdm\category\training\ECP_PDF\st11ecp1502.pdf [Similar documents]

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83% ENGINEERING CHANGE PROPOSAL Approved With Change... Note: ECP 1486 Rev. 1 is implementing changes to ME-FA1P1, ME-FC15.M, ME-FD15.M, ME-FG4M, and ME-FG6S.A concurrent to ECP 1586R3. The changes will be reconciled by the authors of both ECPs. Note: The proposed fault tree changes in this ECP are shown in a WASTIS format. [Source: CategoryTraining] [Size: 1211 KB] iposdm\category\training\ECP_PDF\st11ecp1389x3.pdf

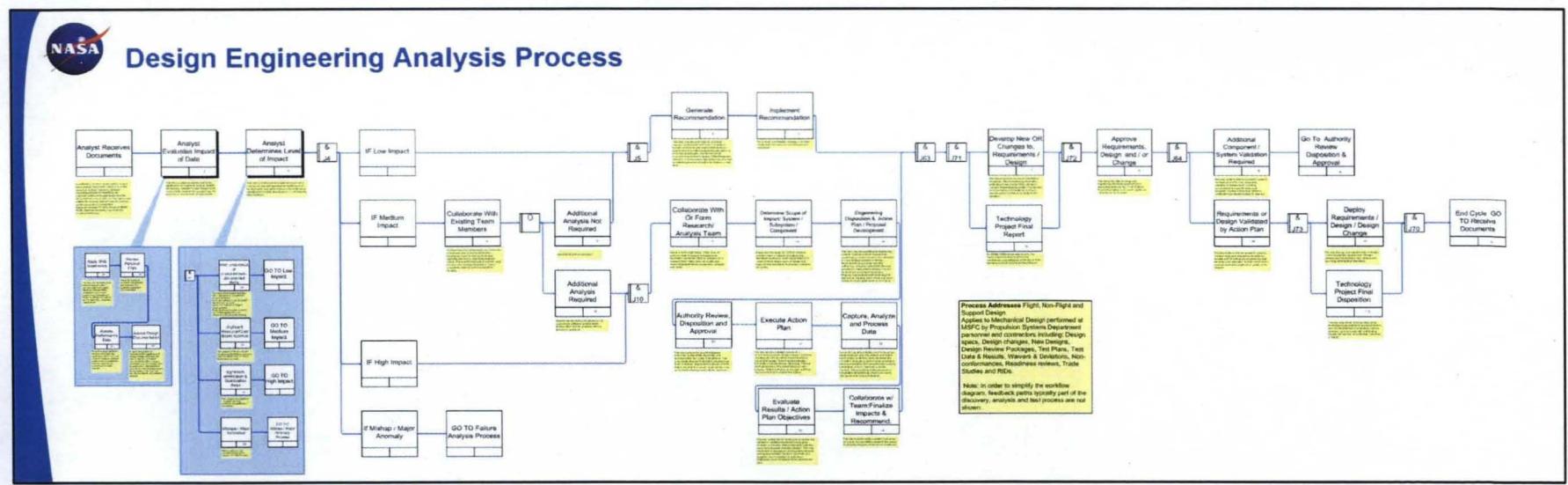
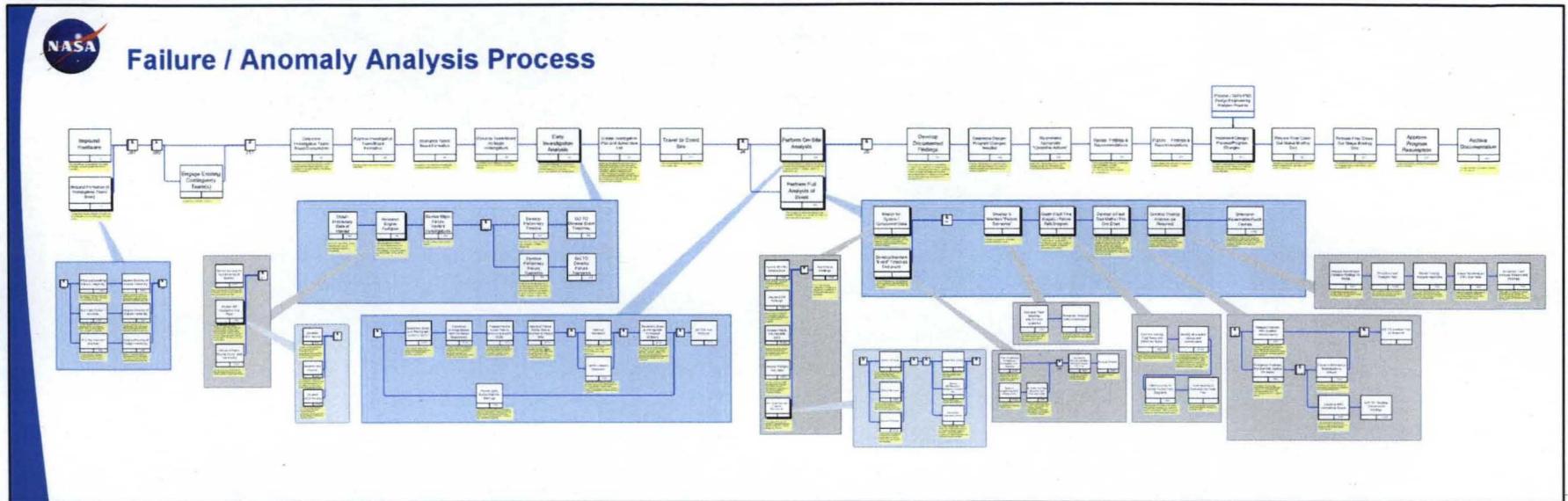
Single Sign-On Access

Done My Computer



MSFC PSD KM PILOT PROJECT

Process Workflows Integral to KM Architecture





MSFC PSD KM PROJECT

User Interface Navigation Flow

FA Process Viewer - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites Home Print Mail Find Stop Go Links

Address http://localhost/portal/site/psdkm/menuitem.d5a640187469fbc5d06a5ad20f8f7818/#

National Aeronautics and Space Administration NASA - PSDKM Site Home | Site Colors | Administration My Account | Logout

You are logged in as admin account

Search DEA Process Viewer FA Process Viewer CAD Viewer Training My Pages

FA Process Viewer

Process Model

- Impound Hardware and Records
 - F1 - Impound Hardware and Records
 - F2 - Request Formation of Investigative Team(s)
 - F3 - Engage Existing Contingency Team(s)
 - F4 - Determine Investigative Team/Board Formation
 - F5 - Approve Investigative Team/Board Formation
 - F6 - Announce Team/Board Formation
 - F7 - Convene Team/Board (to Begin Investigation)
 - F8 - Early Investigation Analysis
 - F9 - Refine Investigative Plan and Action Items
 - F10 - Travel to Event Site
 - F11 - Perform On-Site Analysis
 - F12 - Perform Full Analysis of Event
 - F12A - Research System / Component Data
 - F12B - Update/Maintain "Event" Timeline
 - F12C - Update & Maintain "Failure Scenario" Matrix
 - F12D - Finalize Fault Tree Analysis / Fault Tree Matrix
 - F12E - Develop / Update Fault Tree Matrix**
 - F12E1 - Produce Credible / Non-Credible Causes
 - F12E2 - Categorize Findings: Pro/Cause
 - F12E3 - Cause is Relevant or Inconsequential
 - F12E4 - Cause is NOT Relevant to the Event
 - F12F - Conduct Testing / Analysis (as required)
 - F12G - Determine Reasonable Event Causes
 - F13 - Develop Documented Findings
 - F14 - Determine / Recommend Design/Program Changes
 - F15 - Approval / Redirection of Findings and Recommendations
 - F16 - Publish Findings & Recommendations
 - F17 - Document/Submit Lessons Learned & Best Practices
 - F18 - Implement Design / Process / Program Changes
 - F19 - Prepare Final Close-Out Package / Briefing
 - F20 - Release Final Close-Out Package / Briefing
 - F21 - Approve Program Resumption
 - F22 - Archive Documentation

Overview Map 110%

Full Analysis

Parent

```
graph LR; AND1[AND] --> F12A[Research System / Component Data]; AND1 --> F12B[Update/Maintain "Event" Timeline]; AND1 --> F12C[Update & Maintain "Failure Scenario" Matrix]; AND1 --> F12D[Finalize Fault Tree Analysis / Fault Tree Matrix]; AND1 --> F12E[Develop / Update Fault Tree Matrix / Pro Con Chart]; AND1 --> F12F[Conduct Testing / Analysis (as Required)]; AND1 --> F12G[Determine Reasonable Event Causes];
```

F12E

Process Step Name: Develop / Update Fault Tree Matrix / Pro Con Chart

The Fault Tree Matrix supports the Fault Tree Analysis Diagram by providing a worksheet of failure causes, fault tree cross references, pros (evidence supporting contribution to the observed condition), cons (evidence exonerating the cause as a contributor to the observed conditions) and status. This will be a working document and will be updated until the investigation is complete, and all credible causes dispositioned.

Process Description:

Policies / Procedures:

Mishap & Anomaly Procedure, NPR-8621.1 (NASA Procedural)

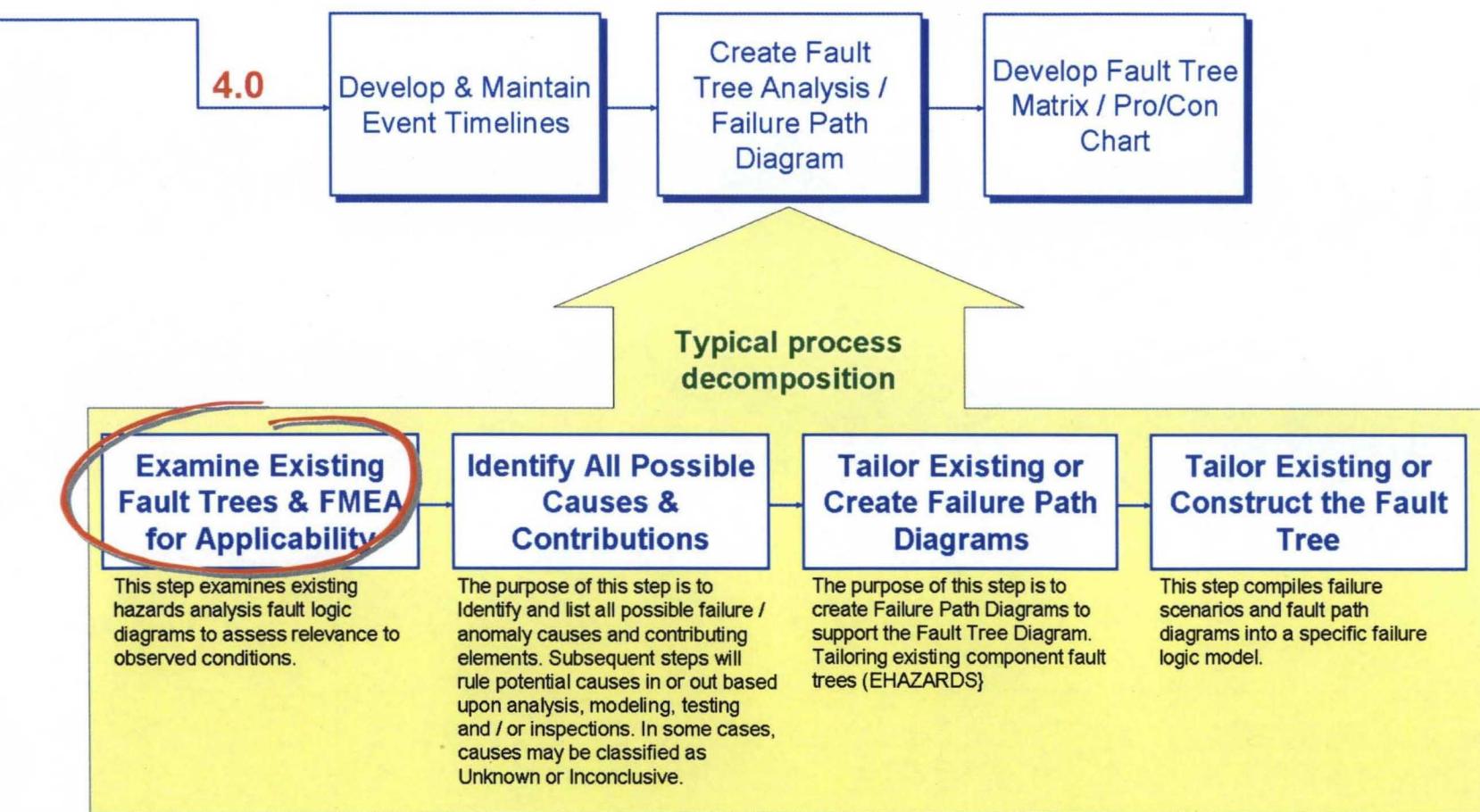
Local intranet



MSFC PSD KM PROJECT

User Interface Navigation Flow

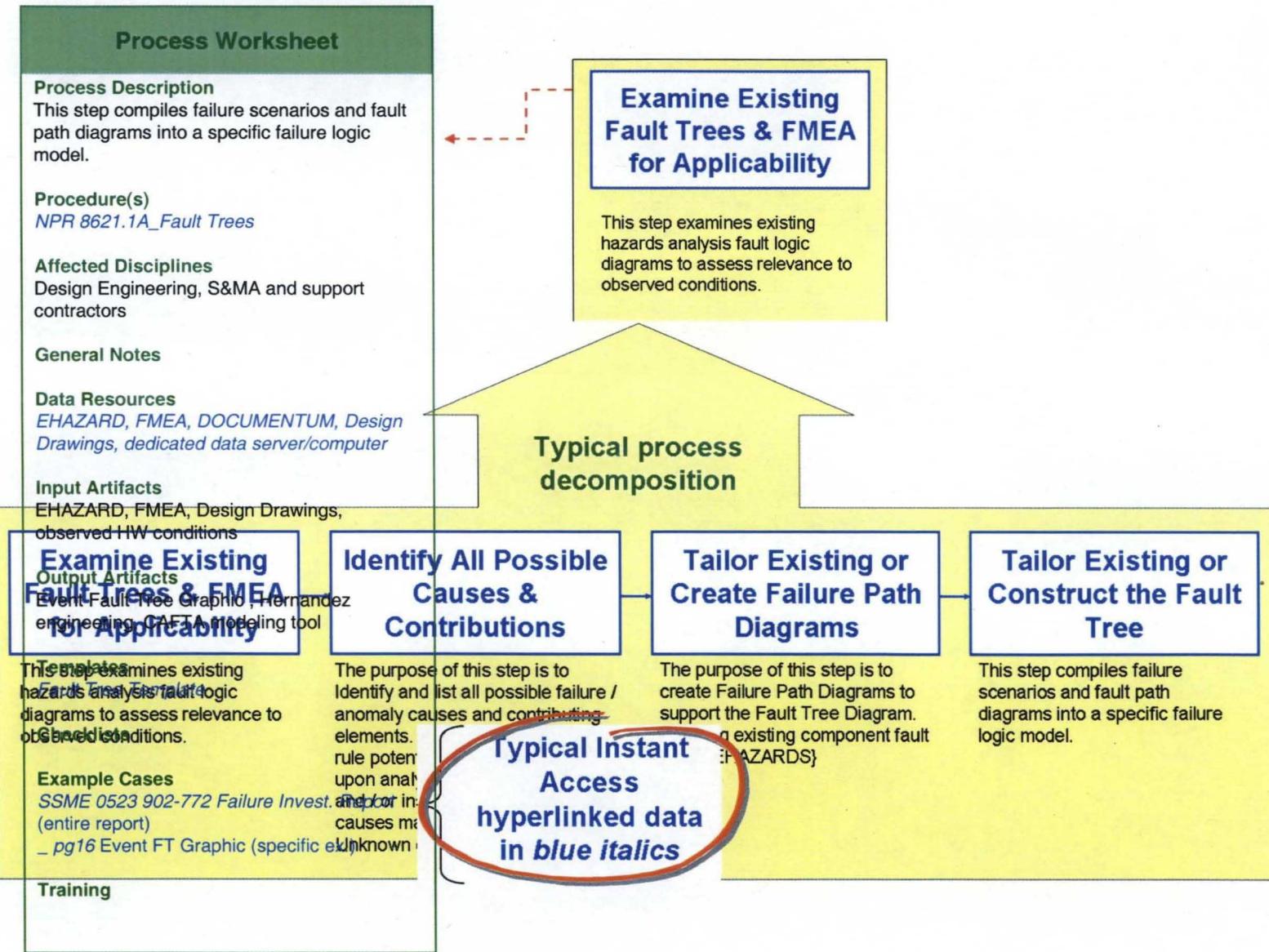
Community of Practice Process Workflow Navigation





MSFC PSD KM PROJECT

User Interface Navigation Flow





MSFC PSD KM PROJECT

User Interface Navigation Flow

Process Worksheet

Process Description
This step compiles failure scenarios and fault path diagrams into a specific failure logic model.

Procedure(s)
[NPR 8621.1A_Fault Trees](#)

Affected Disciplines
Design Engineering, S&MA and support contractors

General Notes

Data Resources
EHAZARD, FMEA, DOCUMENTUM, Design Drawings, dedicated data server/computer

Input Artifacts
EHAZARD, FMEA, Design Drawings, observed HW conditions

Output Artifacts
Event Fault Tree Graphic , Hernandez engineering, CAFTA modeling tool

Templates
[Fault Tree Template](#)

Checklists

Example Cases
*SSME 0523 902-772 Failure Invest. Report (entire report)
_ pg16 Event FT Graphic (specific ex.)*

Training

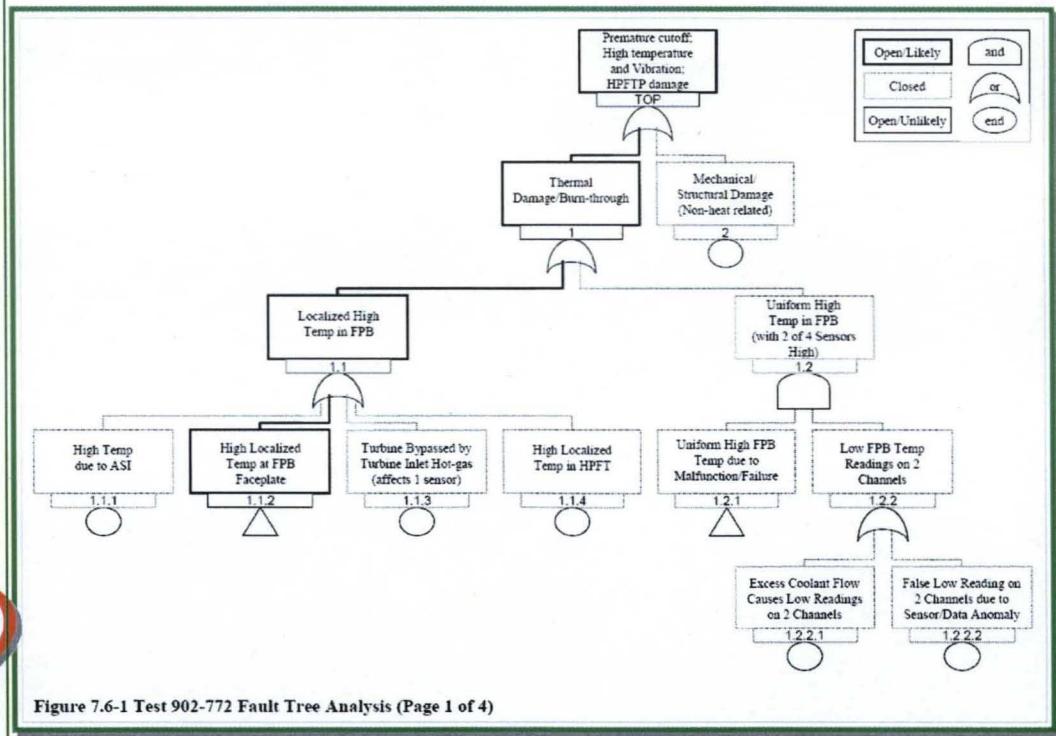


Figure 7.6-1 Test 902-772 Fault Tree Analysis (Page 1 of 4)



MSFC PSD KM PROJECT

User Interface Navigation Flow

Category Search Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites Bookmarks 3581 blocked Check All Alerts Send to nasa msfc

Address: C:\PSD KM\Sample UI\Category Search.htm

Google nasa msfc Go RS Bookmarks 3581 blocked Check All Alerts Send to nasa msfc Settings

Marshall Space Flight Center

+ NASA Home
+ MSFC Home

- Propulsion Systems Department Knowledge Management System

Turbine blade ECP

Basic Advanced Boolean Parametric + GO

Categories Data Sources Query Parameters

- Home
- Lessons Learned
- Best Practices
- Configuration
 - Critical Design Review
 - Drawings
 - Engineering Change Proposals (ECP)**
 - Field Engineering Change (FEC)
 - Hardware Readiness Review (HRR)
 - High Pressure Oxidizer Turbopump (HPOTP) Photographs
 - Material
 - Critical Items List (CIL) / Hazards
 - Failure Mode & Effects Analysis (FMEA)
 - Design Environment
 - History
 - Non-Conformance
 - Service Life
 - Verification & Validation

+ COMMUNITIES + PROCESS + CAD VIEWER + MY PAGE + SEARCH

- RETRIEVAL + COMMUNITY + CATEGORIES + CLUSTERING + SAVE

CAD VIEWER

Retrieval Results Suggested Categories Suggested Clusters

1 - 6 of 501 results

Matching documents from IDOL

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Approved With Changes/Rocketdyne concur applied Sheet 1 of 709 1. Contractor: CAGE 02602 2. Contract: 3. PCIN: 4. ECP No.: 5. Rev.: Pratt & Whitney Rocketdyne, Inc. NASA-0140 170264
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[Size: 4236 KB]
ipodimCategoryTraining\ECP_PDF\st11ecpt399c2.pdf
[Similar documents]

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Pages Affected Remarks NASA Disposition/ Authorization Basic This ECP is to update the SSME Hazard reports references to the new integrated hazard reports.
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[Size: 3580 KB]
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[Similar documents]

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[Similar documents]

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[Similar documents]

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[Source: CategoryTraining]
[Size: 1211 KB]
ipodimCategoryTraining\ECP_PDF\st11ecpt386c2.pdf

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User Interface Navigation Flow

CAD Viewer - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites Home Links

Address http://localhost/portal/site/psdkm/menuitem.ca43c8ab62632cc5d06a5ad20f8f7818/ Go

National Aeronautics and Space Administration NASA - PSDKM Site Home | Site Colors | Administration My Account | Logout

You are logged in as admin account

Search DEA Process Viewer FA Process Viewer CAD Viewer Training My Pages

CAD Viewer

2D CAD Drilldown Portlet

D-BLADE-MAIN OXZ PUMP TURBINE 2STA (view) x 54
F-BLADE-MAIN OXZ PUMP TURBINE 3STA (view) x 53
P-SPACER-INTERPROPELLANT CONVERTER (view) x 1
T-INVERTED NUT SPNL R 125-12X.575. (view) x 1
L-WASHER-KEY 2335IDX.3770DAK.021 x 2
F-INVERTED NUT SPNL R 100-12X.575. (view) x 1
P-SPACER-INTERPROPELLANT CONVERTER (view) x 1
F-WASHER-SPGT 3.300X3.575X.012 x 1
F-DAMPER-MAIN OXIDIZER PUMP TURBIN x 54
F-DAMPER-MAIN OXIDIZER PUMP TURBINE 3STA x 54
F-DAMPER-MAIN OXIDIZER PUMP TURBINE 4STA x 54
G-RING-RTG7.894 HSD D X.140X1.005 (view) x 1
G-RING-RTG7.894 HSD D X.140X1.005 (view) x 1
H-RING-ANTI-ROTATION TURBINE STATOR x 1
R-BLADE-MAIN OXZ PUMP TURBINE 1STA (view) x 1
J-BLADE-MAIN OXZ PUMP TURBINE 2STA (view) x 1
J-BLADE-MAIN OXZ PUMP TURBINE 3STA (view) x 1
H-GASKET- 885 COX.127 SPRING x 1
G-BOLT-MACHINE 190-32..625.DH x 22
G-BOLT-MACHINE 190-32..688.DH x 8
G-BOLT-MACHINE 190-32..688.DH x 24
G-BOLT-MACHINE 190-32..1.005.DH x 41
F-BOLT-MA .3125-25.500.DRILLED DH x 20
J-BOLT-MACHINE 190-32X.625.DH x 2
J-RETAINER-SEA
F-PLUG-INSTRUMENTATION 164-34X.562.DH x 4
H-BOLT-MACHINE 190-32X.500.DH x 1
H-BOLT-MACHINE 190-32X.875.DH x 4
E-WASHER-KEY .2335IDX.3770DAK.021 x 2
K-PLATE-MAIN OXIDIZER PUMP BEARING
H-HOUSING-FREE OXIDIZER PUMP BEARING (view) x 1
C-PIN-SHLDR.HDLG.1975X.375X.9225 x 3
H-BOLT-INSTRUMENTATION ADAPTER.1. x 26
G-BOLT-INSTRUMENTATION ADAPTER.3.3 x 1
J-BLADE-MAIN OXZ PUMP TURBINE 1STA (view) x 1
S-WASHER-KEY .5.030X3.303X.031 x 1
P-CONNECTOR ASY-OXO-TUBE PURGE SUPPLY (view) x 1
J-PLUG-INSTRUMENTATION BOSS x 1
D-BOLT-MAIN OXIDIZER PUMP TURBINE 1STA x 4
C-BOLT-HEAT EXCHANGER 190-32X.680.DH x 11
D-SLEEVE-OXIDIZER TURBOPUMP SHAFT (view) x 1
D-TIE ROD .5625-18X2.640.SOCKET x 1
F-TRAIL-PIPE FIXT PUMP TURBINE 1STA x 1

Disc Coolant Tubes (0.250") 4 places. 347 SS

Turbine Inlet 3 Tooth Knife Edge

Coolant Manifold

Retaining Plate

Deflector & Flow Guide INCO 909

CAVAL Disk and Shaft PWA 1074. IN100, R

IN100

440C Races

Deep Drill by Dearborn, Mich.

Pwr. Split
1stg 38%
2stg 36%
3stg 26%

IPS Sleeve 718, NR

Pre-load Spring

Torsion Spring IN100

440C Racers

Local intranet

Overview Map

4:1

Keyword Search

Drawing Number: 4750102

Description: P-BLADE-MAIN OXZ PUMP TURBINE.2STA (view) x 54

Drawings: 4750102[1].001-P.tif

Qty: 54

Formatted CSN / Find Number: 033-0000

Keywords: 4750102,"turbine blade"

Design Environment: file:///Z:/SSME-Technical/SSME/Design-Certification Reviews/Turbomachinery/HPOTP Current information provided is not current. The User must correct the data for Block II

Materials: Assembly Drawing

Build/Assembly Procedure: Future implementation



MSFC PSD KM PROJECT

User Interface Navigation Flow

The screenshot shows a NASA website interface. On the left, there's a sidebar with links like Home, Simple Search, Advanced Search, Category Search, Search Tips, and Popular Search Terms. The main content area features a large image of a mechanical component, possibly a valve or pump, with a red arrow pointing to a specific part. Below the image, a red box highlights component details: Find Number: 0123456789, Material Properties: Readiness Review; Quantity (per build): 123456, Readiness Review; Drawing Number: 7890-1234, 902-772 Incident; Material: Super Alloy, Hydrogen Flow.

Find Number:	0123456789	Material Properties
Quantity (per build):	123456	Readiness Review
Drawing Number:	7890-1234	902-772 Incident
Material:	Super Alloy	Hydrogen Flow

Graphic “Drill - Down” Capability
Component Details View



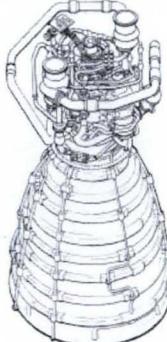
MSFC PSD KM PROJECT

User Interface Navigation Flow


Atlantis STS-106
Space Shuttle Program
SSME Flight Readiness Review
August 29, 2000

G. HOPSON
29 August 2000

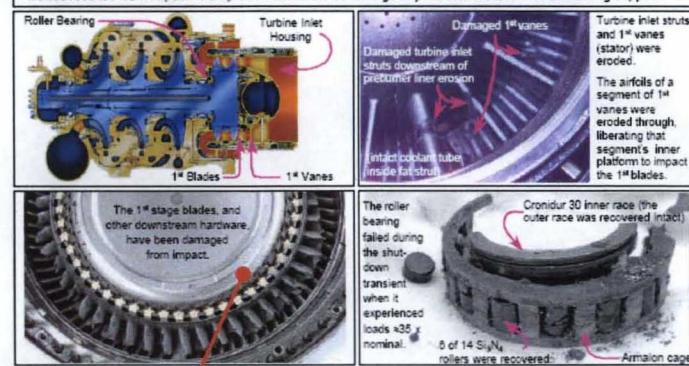
1



Space Shuttle Main Engine
SSME 0523, 902-772 Incident Investigation

Damage to the HPFTP/AT

The majority of the damage occurred in the turbine-end. Damage incurred in the turbine downstream of the 1st blades resulted from impact. Pump-end hardware was damaged by rub and the loss of roller bearing support.



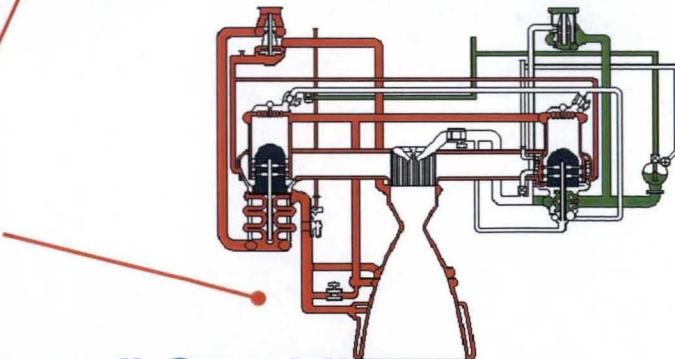
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2

3

4

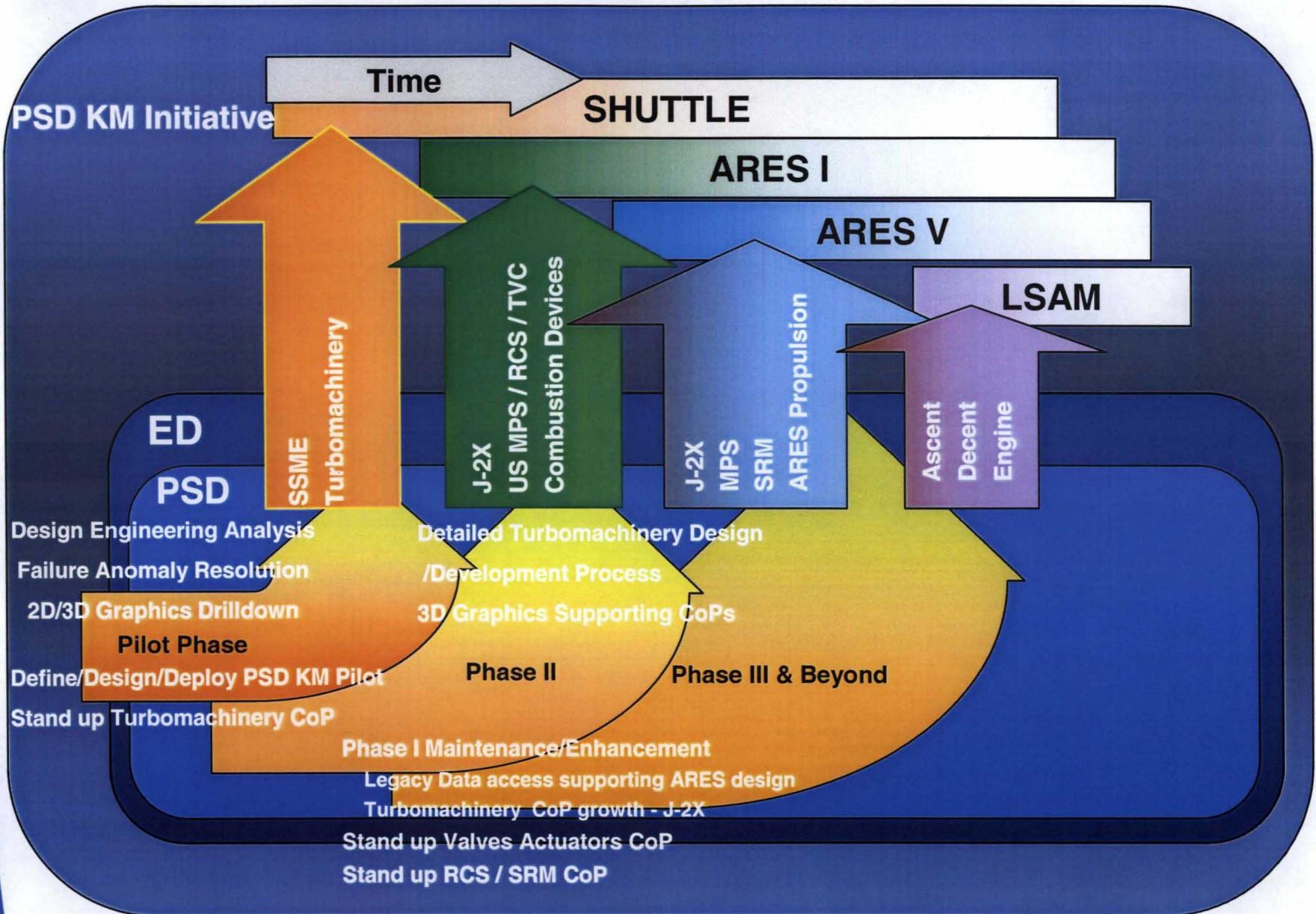
Find Number:	0123456789	Material Properties
Quantity (per build):	123456	Readiness Review
Drawing Number:	7890-1234	902-772 Incident
Material:	Super Alloy	Hydrogen Flow



**Graphic “Drill - Down” Capability
Component Details View (Links)**



PSD KM PROJECT FUTURE PLANNING





MSFC PSD KM PROJECT

Communications & Roll-Out

- **PSD KM System Briefings:**

• JSC Knowledge Management Conference	02 March 06
• ER Dept. Managers Brief	06 April 06
• MSFC Technology Council	11 April 06
• ED Management Brief	02 May 06
• SSME Project Management Brief	09 May 06
• SRS Review (Stakeholders)	31 May 06
• Conceptual Design Review (Stakeholders)	29 June 06
• PWR Meetings, Canoga Park	11 July 06
• HQ Meetings, CIO, InsideNASA/NEN/ ESMD	13 July 06
• NACB-ISCB Brief	23 August 06
• Preliminary Design / UI Review (Stakeholders)	29 August 06
• Critical Design Review (Stakeholders)	03 October 06
• WEB PCASS	07 February 07
• Enterprise Architecture Advisory Committee	17 February 07
• Engineering Management Council	20 February 07
• RSIC	23 February 07
• IEC/DDMS	27 February 07
• Exploration Launch Office Brief	05 March 07
• IHS/NASA Tech Standards	22 March 07
• CIO/ED/CLV Data Architecture	26 March 07
• Cx Data Architecture Working Group	23 April 07
• CLV Chief Engineers Brief	20 April 2007
• NASA HQ IDM Workshop	24 – 26 April 2007
• CLV Element Managers	08 May 2007
• Directives Access CIO	17 May 2007
• Cx ARC Architecture Team	22 May 2007
• PWR KM Program Manager Review	24 may 2007
• Engineering Directorate Review	13 June 2007
• Propulsion Department Review	14 June 2007
• NASA KM International Conference	17 – 19 July 2007



MSFC PSD KM Initiative

MSFC PSD KM Information -

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Propulsion Systems Department

NASA / MSFC / ER32

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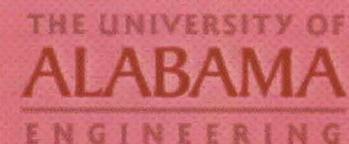
Dr. Randy K. Smith

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Bill Mommsen

Intergraph Corporation

Security, Government & Infrastructure (SGI) Division

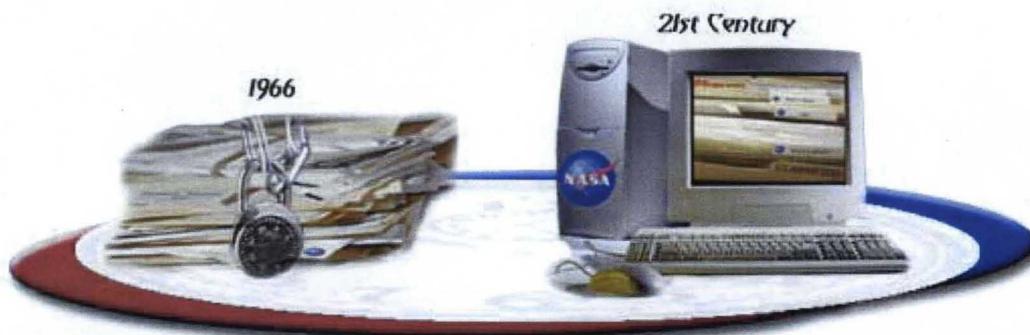
Bill.Mommsen@intergraph.com

256.730.8179





Support





DATA Resource Connection

Data Source	Content
SSME Technical	CM Documents, Nonconformance data, Engine Reviews, HRR, CE Telecons, CDR, DCR, Program reviews, Major Incident reports, IFA's, FMEA, Orientation Training, PWR Drawings, Specifications, Photos, Flight Ops handbook...
MSFC Repository	Adv Lunar systems, Mars exploration, NGLT, IPD, Nuclear Propulsion, Shuttle Projects
LASSE	Apollo, Saturn, ALS, Aerodynamics, Propulsion, Cryogenics, Centaur, X-vehicle
MSFC Multi-Program/Proj Docs	MSFC Specifications, Standards, Requirements, Handbooks, Plans, Processes
MSFC Directives Master List	MSFC Policy Directives, Procedural requirements, Work instructions, Guidance Manual
PRACA (MSFC)	All Shuttle Problem Reports and Corrective Action
Shuttle Online	Flight Readiness Reviews, PSE&I, CERB, PRB docs, Intg Weekly Reports, Shuttle Contingency plan, Shuttle CM Plan
Jetson	SSME Data Review Packages (Test & Flight)
STI Database (Scientific & Technical Information)	Aeronautics/Astronautics, Chemistry, Physics, Mathematics, Computer Science, Engineering, Space Science, Geo Science
NASA Technical Standards	AIAA, AMS, ASTM Material Specifications, ANSI/ABMA/NAS Aerospace Standards, Mil Stds Industry Stds
WebPCASS	All PRACAs (KSC PRs, IPR, DRs, GFE, MSFC UCRs, IFAs) Shuttle CIL / HA, OMRSD, LCC, Waivers
SSPWEB	NSTS 7700 volumes
Shuttle Portal	Shuttle Project collaboration, Project data
NEN	Inside NASA, LLIS, Online directives, NASA Image exchange, Electronic parts and Packaging
RISC	Technical and Scientific reference books, manuals Journals.
ICE Windchill	Structured Data Management system, All ESMD program data , Schedules, EVM, Risk Management
IEC/ DDMS	Integrated design environment, Configuration Management system.
Maptis	Materials specifications and properties testing
CASI	Technical, Scientific reports , Journals, Articles, Papers
Contractor Data systems	Metaphase, Nexprize, ACTs, ADM, Prams, Rams,
Pilot Indexed	Phase II
MOU Negotiation Underway	Long range



MSFC PSD KM PROJECT

Unique Functionality

- **Community of Practice** – Provides a forum for individuals with shared interest or expertise to exchange ideas and experiential knowledge
 - Collaboration / Sharing, Knowledge Capture, Expertise Locator, Training
- **Single Sign On** – MSFC domain log in provides authenticated user access to PSD KM and all authorized accounts
- **Automatic Profiling** – Monitors user data interaction preferences and automatically forms profiles of their interest and expertise
- **Categorization** – Automatically categorizes data without the need for manual intervention
- **Disparate Repository / Unstructured Data Interface** – Access data where it resides within or outside of product structure / data management system environment
- **Conceptual Retrieval** – Extracts meaning from key words and complex terminology embedded in query information; Returns search results based on concept matching



MSFC PSD KM PROJECT

Unique Functionality (Cont'd)

- **Hardware Graphics Viewer** – Point and click access from graphic image to broad range of related design information, subject matter expertise, lessons learned and training
- **Process Workflow Viewer** – Enables the user to locate relevant information within the context of a process step
 - Search and retrieval functionality from Failure/Anomaly and Design Engineering Analysis workflow navigation, "process-based" data associations
- **Expertise Locator** – Automatically identifies individuals with expertise in organizations and identifies subject matter knowledge in any required field
- **KM awareness, cultural change/motivational training** - Integral to CoP roll out



PSD KM / PDMS Design Characteristics

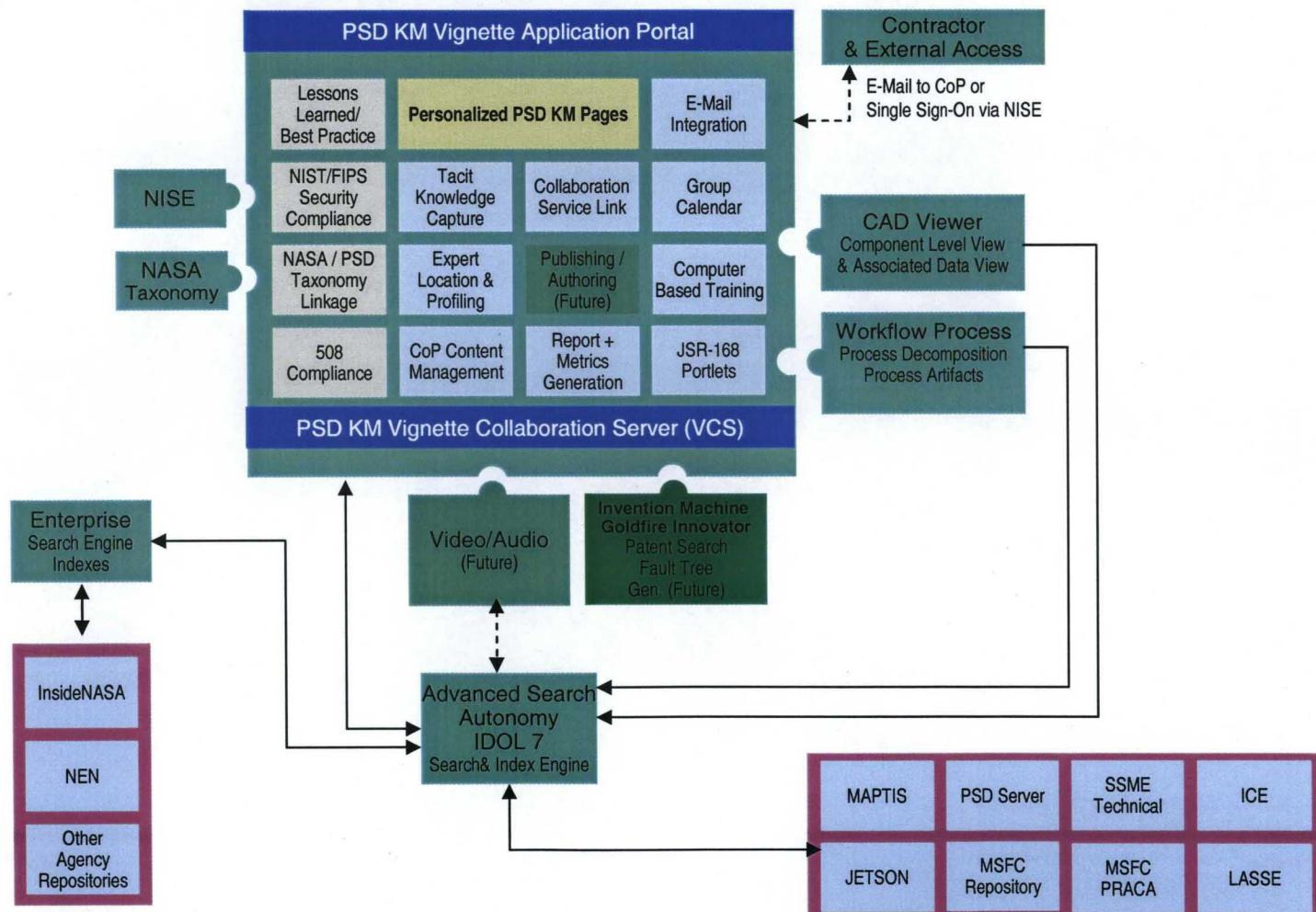
	PSD Knowledge Management	Product Data Management
Focus Area	Individual & Collective Knowledge	Managing Product/Project Data
Information Management	Unstructured information Contextual search outside of PDMS	Structured Information Search limited to PDMS data structure
Timeframe	Ongoing. Doesn't stop as long as the body of knowledge is relevant.	Project Life cycle. Has a finite start and end date.
Scope	Any repository or information source that contains useful knowledge	Only information contained in its internal repository.



MSFC PSD KM PILOT PROJECT

Design / Architecture (Pilot)

Componentized Resources System View



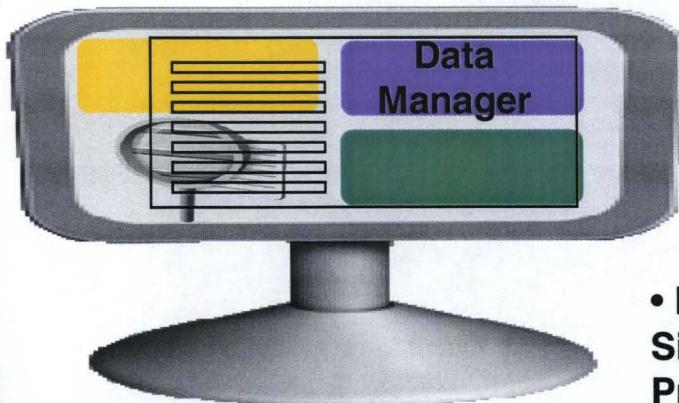


CoP Process Creation / Maintenance



CoP User Inputs Process / Change

- Use CoP Input Template and MS Office Suite to Propose Process Workflows
- Submit Using CoP Suggestion Box
- Post to Community Forum



- Data Manager to Allow Simple Maintenance of Process Data & Links

CoP Moderator Leads Review

- Recommended as Best Practice
- Review w / Initiator
- Collaborate w/ SMEs
- Approve / Reject



Enter & Validate Process / Data

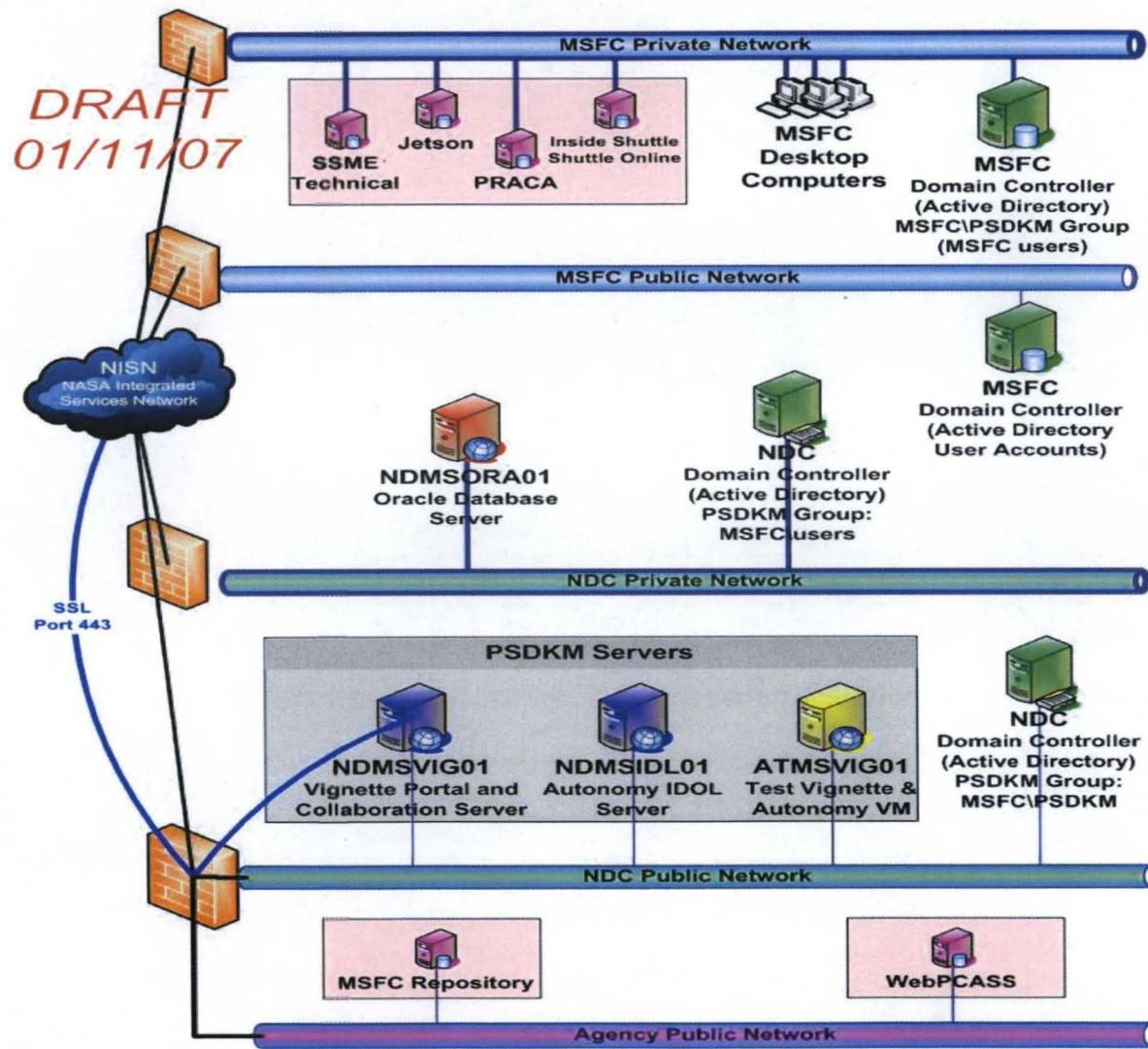
- Load Process Model / Data
- Validate in Process Viewer
- Publish in Community Knowledge Storehouse

Community Can Create New, Change Existing and Maintain Processes



MSFC PSD KM System

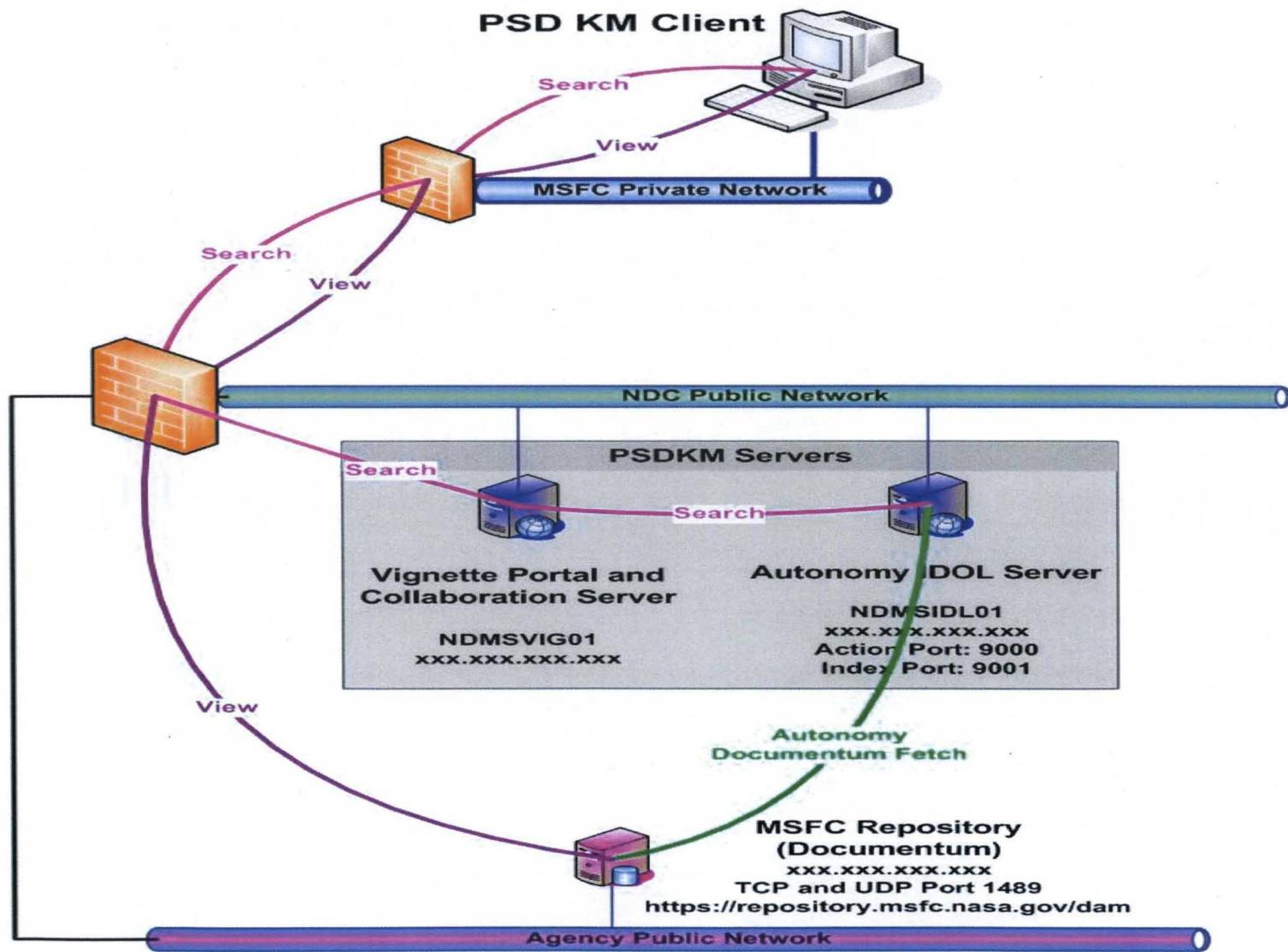
Pilot Portal Schematic





MSFC PSD KM System

Pilot Portal Schematic, Documentum Query/Fetch





MSFC PSD KM PROJECT

KM Pilot System Data Security

Security Policy

- **Designed for Compliance with Enterprise Architecture**
- **Enforcement of internal authentication models for repositories, proprietary applications, and software.**
- **Portal LDAP ensures automatic verification against user, group and role level entitlement**
 - Will align with the NDC active directory, migrating to NISE
- **KM Program will comply with NPR 2810.1, NIST 800-53**
 - Moderate security classification based on FIPS 199, NIST 800-60
- **Application Security Plan is in Work**